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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/643,684	08/18/2003	Thomas Kenny	COOL-01600	4600

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EXAMINER
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MCKINNON, TERRELL L

ART UNIT	PAPER NUMBER
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3743

DATE MAILED: 08/12/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

<b>Office Action Summary</b>	<b>Application No.</b> 10/643,684	<b>Applicant(s)</b> KENNY ET AL.	
	<b>Examiner</b> Terrell L Mckinnon	<b>Art Unit</b> 3743	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

#### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

#### Status

- 1) ☒ Responsive to communication(s) filed on 18 August 2003.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

#### Disposition of Claims

- 4) ☒ Claim(s) 1-54 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-28 and 30-53 is/are rejected.
- 7) ☒ Claim(s) 29 and 54 is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

#### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 18 August 2003 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

#### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All    b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

#### Attachment(s)

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)  | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)   | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152)             |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)<br>Paper No(s)/Mail Date <u>1</u> . | 6) <input type="checkbox"/> Other: _____  |

## DETAILED ACTION

### ***Claim Rejections - 35 USC § 102***

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

2. Claims 1-5, 7-10, 15, 19-21, 26, 27, 30-34, 36-39, 44 and 48-52 are rejected under 35 U.S.C. 102(b) as being anticipated by Benett et al. (U.S. 5,548,605).

Benett discloses a monolithic micro-channel heat sink comprising all of the applicant's claimed and disclosed limitations of the instant invention.

### ***Claim Rejections - 35 USC § 103***

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

4. Claims 6, 28, 35 and 53 are rejected under 35 U.S.C. 103(a) as being unpatentable over Benett et al. (U.S. 5,548,605) in view of DeBoer et al. ( U.S. 6,632,71).

Benett's invention discloses all of the claimed limitations from above except for the etchant comprises tetramethyl ammonium hydroxide (TMAH); and wherein the narrowing trench has a depth:width aspect ratio of at least approximately 10:1.

5. However, DoBoer teaches etchant comprises tetramethyl ammonium hydroxide (TMAH); and wherein the narrowing trench has a depth:width aspect ratio of at least approximately 10:1 (column 9, lines 40-50).

Given the teachings of DoBoer, it would have been obvious to one of ordinary skill in the art at the time of the invention to modify the heat sink of Benett with the etchant comprises tetramethyl ammonium hydroxide (TMAH); and wherein the narrowing trench has a depth:width aspect ratio of at least approximately 10:1.

Doing so would provide an alternative etchant for silicon chip cooling.

6. Claims 16-18, 22-25 and 45-47 are rejected under 35 U.S.C. 103(a) as being unpatentable over Benett et al. (U.S. 5,548,605) in view of DeBoer et al. (U.S. 6,632,71) as applied to claims above, and further in view of Zingher (U.S. 5,310,440).

Benett's invention discloses all of the claimed limitations from above except for the manifold layer comprising a first plurality of interconnected hollow fingers and a second plurality of interconnected hollow fingers, the first plurality of interconnected hollow fingers providing flow paths to the one or more first apertures and the second plurality of interconnected hollow fingers providing flow paths from the one or more second apertures; the first plurality of interconnected

hollow fingers and the second plurality of interconnected hollow fingers lie substantially in a single plane; coupling a pump to the first plurality of interconnected hollow fingers; the cooling material comprises a liquid water; and the cooling material comprises a liquid/vapor mixture.

7. However, Zingher teaches a manifold layer comprising a first plurality of interconnected hollow fingers and a second plurality of interconnected hollow fingers, the first plurality of interconnected hollow fingers providing flow paths to the one or more first apertures and the second plurality of interconnected hollow fingers providing flow paths from the one or more second apertures; the first plurality of interconnected hollow fingers and the second plurality of interconnected hollow fingers lie substantially in a single plane; coupling a pump to the first plurality of interconnected hollow fingers; the cooling material comprises a liquid water; and the cooling material comprises a liquid/vapor mixture.

Given the teachings of Zingher, it would have been obvious to one of ordinary skill in the art at the time of the invention to further modify the micro-channel heat sink of Benett with a manifold layer comprising a first plurality of interconnected hollow fingers and a second plurality of interconnected hollow fingers, the first plurality of interconnected hollow fingers providing flow paths to the one or more first apertures and the second plurality of interconnected hollow fingers providing flow paths from the one or more second apertures; the first plurality of interconnected hollow fingers and the second plurality of interconnected hollow fingers lie substantially in a single plane; coupling a pump

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to the first plurality of interconnected hollow fingers; the cooling material comprises a liquid water; and the cooling material comprises a liquid/vapor mixture.

Doing so would provide cooling flow paths for efficiently controlling the temperature of the heat sink.

8. Claims 11-14 and 40-43 are rejected under 35 U.S.C. 103(a) as being unpatentable over Benett et al. (U.S. 5,548,605) in view of DeBoer et al. ( U.S. 6,632,71) as applied to claims above, and further in view of Newton et al. (U.S. 6,437,981).

Benett's invention discloses all of the claimed limitations from above except for manifold and interface layers being bonded by adhesively bonding; anodic bonding; thermal fusing; and eutectucally bonding to each other.

9. However, Newton teaches a pluralities of composite components being bonded by anodic bonding; the pluralities of composite components are bonded with a thermoplastic bonding sheet by thermal fusing; and silicon and glass composite components bonded to each other (Fig. 17B).

Given the teachings of Netwon, it would have been obvious to one of ordinary skill in the art at the time of the invention to furthermore modify the heat sink of Benett with the manifold and interface layers being bonded by adhesively bonding; anodic bonding; thermal fusing; and eutectucally bonding to each other.

Doing so would provide a reliable and thermally secure connection between the manifold and interface layers.

***Allowable Subject Matter***

10. Claims 29 and 54 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

***Conclusion***


The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. The following references are cited for disclosing related limitations of the applicant's claimed and disclosed invention. Gruber et al, Hamilton et al, Chu et al, Galyon et al, Fahey et al and Chu et al (2 Patents).

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Terrell L Mckinnon whose telephone number is 703-305-0059. The examiner can normally be reached on Monday -Thursday and every other Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Henry Bennett can be reached on 308-0101. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



Terrell L. McKinnon  
Primary Examiner  
Art Unit 3743  
August 6, 2004